DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Keeling Tire Fire: Preliminary Evaluation of Fire Extinguishing Materials

Prepared by: Andrew Duggan, VADEQ, Office of Waste Programs, Technical Support

March, 2002

In mid-March 2002, a tire fire ignited at the Keeling Tire Site in Roanoke County, Virginia. Federal, state, and local officials have responded to the site. Since the application of water may cause the pyrolytic oils to seep into the groundwater, this fire-fighting technique was not chosen. Instead, the site coordinators are evaluating the use of a proprietary product called "FireOut Ice™." This office has been asked to perform preliminary research on the product and the possible environmental consequences of its use.

This evaluation addresses the following: 1) general product information, 2) fate and transport, 3) possible toxicity, 4) and a summary of relevant information. At the end of this document, a list of mentioned individuals is provided with titles and contact information.

General Product Information

FireOut Enterprises is identified as a vendor of FireOut Ice™. FireOut Ice™ is manufactured for FireOut Enterprises by BASF Corporation in North Carolina. Jon Sigemann of BASF provided the following information: "The first thing to note is Aridall 1460 is the product we [BASF] sell to FireOut Enterprises, which they sell as

FireOut Ice. This Aridall 1460 polymer is the same product that was approved by the US Forestry Service as AquaShield back in 1998. Just keep in mind this is only one product with the same chemistry, specifications, and process, with three different names" (BASF, 2002).

VADEQ verified on the USDA Forest Service website that FireOut Ice™ has administrative approval from the USDA Forest Service as a "Fire Chemical." It was approved under the name "Chemdal Aqua Shield." The USDA Forest Service includes this product under the following classification: Fire Suppressant Gels and Elastomers (USDA, 2001) (see attached).

Aridall 1460 is a polyacrylic acid, neutralized, and cross-linked (PANC). The following additional information was provided by BASF.

> "This compound belongs to a class of high-molecular, cross-linked homopolymers of acrylic acid. Polycarboxylate/acrylate chains of variously high-molecular weights are generally cross-linked with each other to manufacture commercially available PANCs" (BASF, 2002). "PANCs may absorb many times their own weight of aqueous liquids, the amount taken up being determined by the ionic strength of the specific liquid. The typical amount taken up varies between 30 and 400 grams of liquid per gram dry weight. After having absorbed liquids, the particles swell and are present in the form of a gel" (BASF, 2002).

USDA has approved FireOut Ice™ for helicopter bucket and ground engine applications. It has been reported that delivery of the product by helicopter bucket may be more difficult. Current application may involve use of hydroseeding machinery. This process provides a thicker blanket on the fire, according to Fire Chief John Miller.

Fate and Transport, Toxicity

This is a fairly new product for extinguishing fires. Since it has absorbant properties, it has been used in diapers and sanitary products. Due to this use, there has been extensive study on the effects that dermal exposure may have.

This product is hydrophilic, so it should not readily absorb the oils resulting from the fire; it is described as minimizing the runoff of liquid. Additionally, the vendor reports that it minimizes the leaching of oils and contaminated water into the groundwater (Richard Rawles, On-Site Coordinator for FireOut Enterprises). "The product acts as a wet blanket over the fire" (Rawles, 2002). It has been reportedly used in agriculture, to absorb and hold in water.

Information gathered from BASF was used to form the following summary of toxicity information. A Material Safety Data Sheet is attached. The information packet provided by BASF to VADEQ contains references to studies that were contracted out to other laboratories by private companies. This report gives mammalian and human information on: 1) dermal exposure, 2) chronic inhalation, 3) acute inhalation, and 4) ingestion.

SUMMARY OF KEYPOINTS: (1) based on data provided by BASF, FireOut Ice™ has been described as a non-poisonous material; (2) the information provided does not address toxicity to soil invertebrates and flora. Thus, with the information provided, this office can not definitively ascertain whether this compound is toxic to flora or soil invertebrates; (3) a concentration of 50 ug/cm^3 was not toxic (there were no adverse effects) to rats in a study. The average exposure to industrial workers in production facilities was around 14 ug/cm^3. See the MSDS for recommended equipment and allowable exposure levels. Based on BASF's and private laboratory information, it is likely that the product is not unacceptably toxic via the inhalation pathway; (4) exposure data would be needed to ascertain the possible toxic activity of the product after exposure to its combustion products—combustion products have been listed as containing the following: carbon monoxide, carbon dioxide, and various hydrocarbons. These are common combustion products.

Summary and Conclusion

With the data provided by BASF and independent laboratories and data provided in two different material data safety sheets, as well as qualitative information from field workers and professionals in the fire-fighting field, it is likely that this product is not unacceptably toxic to the endpoints studied; however, to assess toxicity with relation to the inhalation pathway regarding the combustion products, breakdown of residual products, absorption of systemic toxic constituents, and the plans for disposal of the residual products left at the site -- the gel or other residual forms of the product-- will require more in-depth study. Based on the combustion products listed in the material

data safety sheets, however, it is likely that FireOut Ice™, once ignited, is toxic to no higher degree than other materials with the same combustion products. Note that this statement is valid only in the context and specific purpose of this evaluation. This is a preliminary qualitative conclusion which is based on both primary, peer-reviewed literature as well as literature from private laboratories hired by the generators of this product.

Note that this is a preliminary survey only. U.S. EPA is performing additional research and may develop further information. This preliminary report is not to be taken as an endorsement of any specific product nor its utility in fire suppression. If there are any questions or comments please contact Andrew Duggan at the number or e-mail below.

Contact Information

(1)

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(2)

Jon Siegmann - BASF Corporation. March, 2002. (P) 704-587-1818.

(3)

USDA Forest Service. March 5, 2002. Fire and Aviation Management- Washington Office. Website: <<www.fs.fed.us/rm/fire/download/chemical/qpl_current.pdf>>

(4)

John Miller - State Fire Chief. (P) 434-977-1375 (ext. 3323) (E-mail) millerj@dof.state.va.us

(5)

Brett A. Burdick - Director of Technological Hazards Division, Virginia Department of Emergency Management (P) (804) 897-6510.

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Troy Lapetina - Executive Director of the Virginia Department of Fire Programs. (P)804-371-0220. (E-mail) tlapetina@vdfp.state.va.us

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Randy Zialo - Southern Area Coordination Center (P) 770-458-2464 (E-mail) rdzialo@fs.fed.us

(8)

Richard Rawles - On-Site Coordinator from FireOut Enterprises. (Cell) 571-220-8925.

(9)

Clyde Copeland - (Senior Vice President from FireOut Enterprises.)—Washington Office. (P) 703-729-5369

3/5/02

Fire Chemicals

For use by USDA Forest Service

(Qualified or Approved and commercially available)

Chemical	Mix Ratio	Qualified/Approved Applications[1]					
		Fixed-Wing Airtanker	Fixed-Wing Water Scooper	SEATS	Fixed-Tank Helicopter	Helicopter Bucket	Ground Engine
WETTING AGENTS (Qualified under Forest Service Specification 5100-305b) - Qualified wetting agent is limited to stocks on hand at GSA, fire caches, and work centers. New product received from supplier is not the same chemical and is not qualified.							
KCR	1 qt/500 gal					•	•
FIRE SUPPRESSANT GELS AND ELASTOMERS (Approved under Administrative Work Plan – qualification of these product types will be covered by Forest Service Specification 5100-306a as soon as it is implemented).							
BASF Aqua Shield[2]	0.4-1.2%					★	★
FireOut ICE[2]	0.4-1.2%					★	★
Thermo-Technologies Thermo-Gel[2]	0.4-1.2%					★	★

[1] • Fully Qualified ○ Conditional Approval ★ Administratve Approval

[2] This product was approved under the name Chemdal Aqua Shield.

FIREOUT ENTERPRISES, INC.

Toxicity Data

In human and laboratory testing, superabsorbent polymers have been proven to be non-toxic, thereby decreasing risk to our population and to wildlife.

SUMMARY OF TOXICITY STUDIES

Toxicity studies have been performed by numerous independent laboratories.

Human and Laboratory studies have been performed with the following results:

HUMAN STUDIES:

Repeated Insult Patch Test:

Base Polymer (Uncoated)

Number of Panelists: 109

Results: Irritation: Negative

Sensitization: Negative

Finished Product: Derma-Test Laboratories

Number of Panelists: 52

Results: Irritation: Negative

Sensitization: Negative

Post-it™ brand fax transmittal memo 7671 | # of pages > 2

To Andrea Dickens | From John Miller

Co. | Co.

Dept. | Phone #

Fax # | Fax #

LABORATORY STUDIES

Base Polymer: Cytotoxicity—Agar Overlay

Results: Negative

Primary Skin Irritation: Negative

Acute Dermal Toxicity: Negative

Mutagenicity - Ames assay: Negative

Acute Oral Toxicity: Negative

Primary Eye Irritation

As granular product: Positive

As hydrated gel: Negative

This information is a summary of numerous health & safety tests conducted.

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MATERIAL SAFETY DATA SHEET: May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200. Standard must be consulted for specific requirements.

PRODUCT NAME: **FIREOUT® ICE**

SECTION I MANUFACTURER'S INFORMATION

Manufacturer and Marketer's Name & Address:
FireOut Enterprises, Inc.
P. O. Box 1254
Forest, VA 24551 (804) 534-0636

BASF Corporation
10930 Dumcoot Rd.
Aberdeen, MS 39730

Emergency telephone number: **800/424-9300**

Date Prepared: April 30, 2001

SECTION II HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

Hazardous Components (Specific Chemical Identity	Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
Manufacturer's Recommended Exposure Guideline for Respirable Particulate		–	–	0.05mg/m³	–

PRODUCT IDENTIFICATION

Chemical Name	CAS Number	%
Potassium Polyacrylate, lightly crosslinked	25608-12-2	92 to 98
Water	7732-18-5	2 to 8
Acrylic Acid	79-10-7	<0.02

NFPA/HMIS: Health - 1, Fire - 0 Reactivity - 0, Specific Hazard - None

Dot Class: Not Regulated

SECTION III PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point	- Not Applicable	Bulk Density (Apparent - g/cc)	- 0.5
Vapor Pressure (mm Hg.)	- Not Applicable	Melting Point	- Not Applicable
Vapor Density (AIR = 1)	- Not Applicable	Evaporation Rate (Butyl Acetate = 1)	- Not Applicable
Appearance and Odor	- Off White, odorless		

SECTION IV FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used)	- Not Available
Flammable Limits	- Not Available LEL– UEL–
Extinguishing Media	- As with any fire, wear positive pressure, self contained breathing apparatus in any closed space when fighting fires.
Unusual Fire and Explosion Hazards	- Becomes slippery when wet. - Under certain confined conditions, a fine dust of this material in air may cause a dust explosion if ignited.

PRODUCT NAME: **FIREOUT® ICE**

SECTION V REACTIVITY DATA

Stability: Unstable - ; Stable - X. Conditions to Avoid - None Known

Incompatibility (Materials to Avoid) - Strong Oxidizers

Hazardous Decomposition or By-products - Thermal decomposition: CO, CO_2, hydrocarbons

Hazardous Polymerization - May Not Occur - X. Conditions to Avoid - None Known

SECTION VI HEALTH HAZARD DATA

Route(s) of Entry: Inhalation? Yes Skin? Yes Ingestion? Yes

Health Hazards (Acute and Chronic)
- Contact with eyes, skin or clothing may cause irritation. Care must be taken to minimize exposure and prevent workplace inhalation of respirable dust. Respiratory protection is required for exposures above the recommended level of respirable dust.
- A similar product, ground very finely, produced an inflammatory tissue response in the lungs in a lifetime exposure inhalation experiment with animals.
- According to the EPA "Hazard Categories" under sections 311 and 312 of SARA Title III, this product is considered to meet the applicable definitions of A delayed health hazard.

Carcinogenicity: NTP? No IARC Monographs? No OSHA Regulated? No

Signs and Symptoms of Exposure - Slight irritant effects.

Medical Conditions Generally Aggravated by Exposure - None Known

Emergency and First Aid Procedures -
Eyes: Flush with large quantity of water, consult physician.
Skin: Wash with soap and water.
Inhalation: Remove to fresh air, consult physician.

SECTION VII PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken in Case Material is Released or Spilled: Vacuum (using HEPA filter equipped system) if possible to avoid generating airborne dust. Avoid adding water, the product will become slippery when wet.

Waste Disposal Method: Dispose of in accordance with federal, state and local regulations.

Precautions to be Taken in Handling and Storing: Store in a cool, dry place. Avoid breathing powder. Avoid skin and eye contact.

Other Precautions: Slippery when wet.

SECTION VIII CONTROL MEASURES

Respiratory Protection (Specify Type) - Use NIOSH/MSHA approved or equivalent with high efficiency filter for particulate levels above $0.05 mg/m^3$.

Ventilation - Local Exhaust As appropriate to control airborne dust levels below the applicable exposure limits.
- Mechanical (General) - As appropriate Other - None

Protective Gloves - Impervious rubber

Eye Protection - Safety goggles

Other Protective Clothing or Equipment - None

Work/Hygienic Practices - Use good housekeeping practices.

The information herein has been compiled from sources believed to be reliable and is accurate to the best of our knowledge. However, FireOut and BASF Corporation cannot give any guarantees regarding information from other sources, and expressly does not make any warranties, nor assumes any liability, for its use.

FAX

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DIVISION OF WASTE PROGRAM COORDINATION
FAX #: 804-698-4327

OFFICE OF FINANCIAL ASSURANCE
OFFICE OF GROUNDWATER CORRECTIVE ACTION
OFFICE OF WASTE PROGAMS

TO: Brett Burdick / Chris Wagner

FROM: Jon Ely **698-** 4245

DATE: 3/28/02

FAX #: (540) 774-4070

TOTAL PAGES INCULDING COVER SHEET: ____________

COMMENTS:

As promised Preliminary Evaluation of Fire Chemical